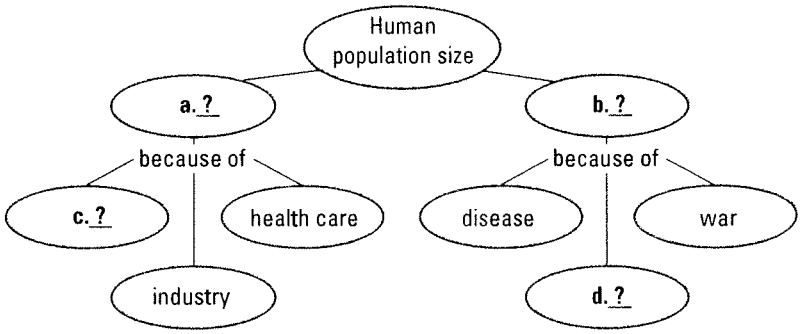
Chapter
13

Human Population

Thousands of runners throng the deck of the Verrazano Narrows Bridge at the start of the New York Marathon. They represent only a tiny fraction of Earth's total human population of more than 6 billion.

Copy the concept map about human population into your notebook. As you read, fill in the concept map, then give it a title.

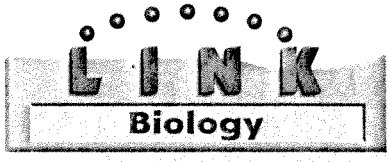


13.1 HISTORY OF THE HUMAN POPULATION

OBJECTIVE • ***Describe*** *the major events that have affected the rate of human population growth throughout history.*

The issue of overpopulation has been a subject of concern for at least four centuries. In the 1500s, English statesman Thomas More portrayed the ideal state in his book *Utopia*. In More's ideal state, population is kept constant, crops are controlled, and food is distributed at public markets and in common dining halls.

Some of the best-known ideas about population growth in the past two centuries were proposed by British economist Thomas Malthus. Writing in 1798, Malthus argued that population growth was not always desirable. Malthus pointed out that populations tend to increase geometrically (1, 2, 4, 8, 16...) whereas the food supply tends to increase arithmetically (1, 2, 3, 4, 5...). The human population, therefore, has the potential to increase at a much faster rate than the food supply. Malthus believed that the tendency of the human population to outgrow its resources would lead to such conditions as famine, war, and other human suffering. To avoid such outcomes, Malthus advocated practices that would reduce the population growth rate, including late marriages and small families. These ideas have been widely discussed and debated ever since.



In 1838, the ideas of Malthus greatly impressed a young naturalist named Charles Darwin who had recently returned from a sailing trip around the world. Malthus's idea that populations tend to outgrow their resources became a major point in Darwin's theory of evolution by natural selection. According to Darwin's theory, organisms produce many more offspring than can survive. Within the population there are a variety of traits. Those individuals with the most favorable traits are the ones that survive and pass their traits to their offspring. Over many generations, favorable traits accumulate in the population, resulting in evolution.

Increases in Growth Rate

Scientists estimate that the first modern humans evolved on Earth approximately 100 000 years ago. Scientists can only guess about population size and growth during the early stages of human history. However, there is some agreement that during this time, the population consisted of hunter-gatherers who lived in small families or tribal groups.

When humans roamed the forests and plains as hunter-gatherers, populations grew slowly. Starvation, predation, and disease prevented people from living long lives—35 may have been considered very old. These conditions kept the infant mortality rate high as well. Between 10 000 and 20 000 years ago, some people began to establish permanent settlements. Evidence suggests that these people did not cultivate food, but they did store food they gathered. Food storage reduced the threat of starvation and lowered the death rate, causing an increase in population size.

Agriculture A major period of population growth occurred around 10 000 years ago when people began to cultivate crops and domesticate animals. *This shift from harvesting wild food sources to producing food through the techniques of farming and herding is known as the* **agricultural revolution.** As agriculture spread and dominated

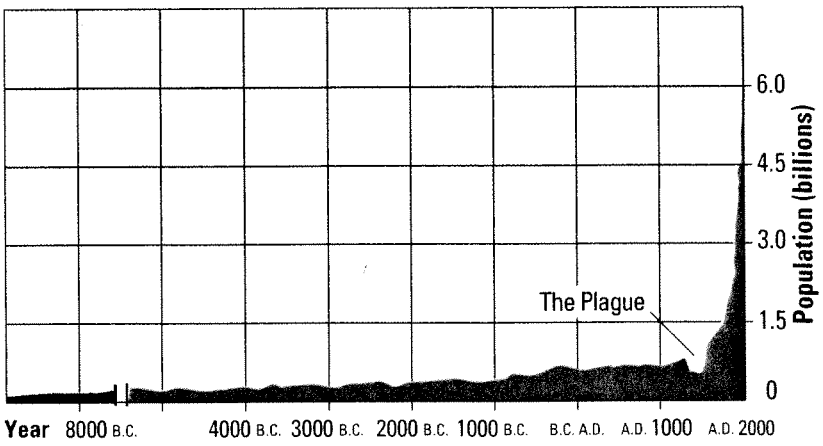


Figure 13.1 The human population grew slowly and irregularly for thousands of years. The growth rate has increased dramatically over the last 300 years, since the beginning of the industrial revolution.

Do It!
Field Activity

What was the population of your city, town, or community 50 years ago? 100 years ago?

1. Use library or town hall resources to find out the history of population change in your town or the nearest large city.
2. What factors accounted for the changes?

other means of obtaining food, nomadic hunter-gatherer societies were gradually replaced by small farming communities, each with its own social structure.

Farming provided an increased and steady food supply, which led to an increase of Earth's human population. In addition, social structure caused a general rise in the standard of living, which reduced mortality rates and increased life expectancy. It is estimated that 9000 years ago there may have been between 5 and 10 million people on Earth.

Industry Another major period of population growth has occurred during the past 300 years. This period of history, marked by the industrial revolution, has included a number of events that favor population growth. Technological advancements have improved food production and distribution, reduced the length of the work day, and provided people with safer work environments. In addition to a greater availability of goods and materials, there have been major technological advances that have improved the quality of health care and medicine.

Health Care The development of the germ theory of disease occurred at the height of the industrial revolution in the late 1800s. *The* **germ theory** *of disease identified bacteria and other microorganisms* (MY-kro-OR-guhn-izuhms) *as the agents responsible for many diseases.* Before the development of the germ theory, people did not recognize the connection between health and hygiene. The germ theory resulted in improved hygiene, sterile surgery, better methods of waste disposal, and water treatment. These developments reduced the death rate, particularly among infants and children.

The biomedical revolution of the twentieth century has also resulted in an increase in population growth. During this revolution, death rates continue to decrease as health and hygiene improve. The discovery of antibiotics and vaccines has wiped out or controlled many life-threatening diseases. In particular, infant mortality has decreased due to better prenatal care.

Declines in Growth Rate

Throughout most of human history, the human population has been increasing. However, population growth has not always been steady and uninterrupted. If you look at the growth curve in Figure 13.1, you will observe a sharp decline in population growth during the mid-fourteenth century. This decline is a result of the bubonic plague, or Black Death, that struck much of Europe and Asia. The plague may have killed more people than any other single disease. So devastating was the plague that within several years it claimed the lives of more than 25 percent of the adult population of Central Europe and Asia. The population of England was reduced by about 50 percent between 1348 and 1379. In addition to the plague, worldwide outbreaks of cholera, typhus, malaria, yellow fever, and smallpox claimed hundreds of thousands of lives. The more densely populated cities became, the more quickly diseases spread.

Figure 13.2 The death and despair brought on by the bubonic plague were common themes in the art of the Middle Ages.

Famine Famine can also devastate human populations. The Irish Potato Famine of the 1840s resulted in the death of more than one million people. At this time, the potato was a main food staple in Ireland. A disease called potato blight destroyed the potato crop, resulting in severe starvation. A famine in China during 1876–1879 was responsible for more than 9 million deaths.

War Wars have a destructive effect on human populations. Combat can claim many lives in a short time period. Other factors that reduce populations, such as disease, famine, and environmental destruction, can occur due to military activities. Cutting off food supplies is a common tactic among warring groups. Examples of wars that have taken enormous tolls on human life include the Thirty Years' War (1618–1648), when about one-third of the inhabitants of Germany and Bohemia were killed. Historically, many lives have also been lost in tribal and civil wars throughout Africa, India, China, South America, and the United States. World War I claimed an estimated 21.5 million lives, while an estimated 35–60 million people may have died as a result of World War II.

SECTION REVIEW

1. What changes in human society occurred during the agricultural revolution?
2. What are some factors that can result in a decline in human populations?
3. **Analyze** If the human population increased arithmetically instead of geometrically, would the potential for an overpopulation problem still exist? Explain your answer.